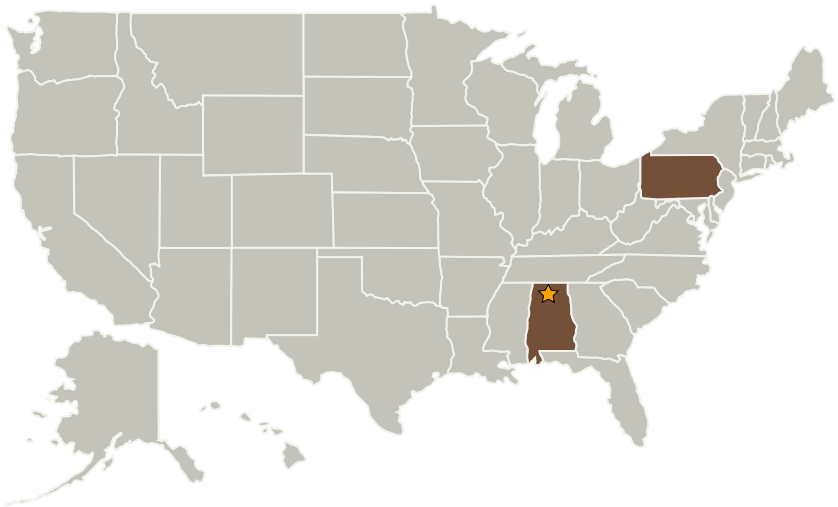
Base Flow Model Validation, Phase II

Completed Technology Project (2006 - 2008)

Project Introduction

The program focuses on turbulence modeling enhancements for predicting high-speed rocket base flows. A key component of the effort is the collection of high-fidelity data for supporting turbulence model validation and calibration. Base flow configurations of interest to NASA Marshal will also be investigated using improved modeling tools. Experiments for supersonic rocket base flows will be performed in the new 12"X12" tunnel, at the National Center for Physical Acoustics (NCPA), utilizing high-quality base flow models, provided by the US Army. Measurements will include Particle Image Velocimetry (PIV) for turbulent statistics, supplemented by Schlieren, Raman spectroscopy and Rayleigh scattering. Complimentary Large Eddy Simulations (LES) will provide additional turbulence statistics that are not readily/reliably measured. The data will support enhancements to the CRAFT Tech unified k-epsilon turbulence model. The impact of employing a variable turbulent Prandtl and Schmidt number methodology, based on a two-equation scalar variance framework, will be considered for reacting and non-reacting base flows. The effort will lead to extended validation of enhanced turbulence modeling tools, increased reliability of base drag & heat flux predictions and fills a major gap at NASA by improving upon base region simulation capabilities required for launcher design aerothermal predictions.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Marshall Space Flight Center(MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
CRAFT Tech - Combustion Research and Flow Technology	Supporting Organization	Industry	Pipersville, Pennsylvania

Primary U.S. Work Locations	
Alabama	Pennsylvania

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX09 Entry, Descent, and Landing
  - TX09.4 Vehicle Systems
    - TX09.4.5 Modeling and Simulation for EDL